

# TELEFUNKEN SERVICE

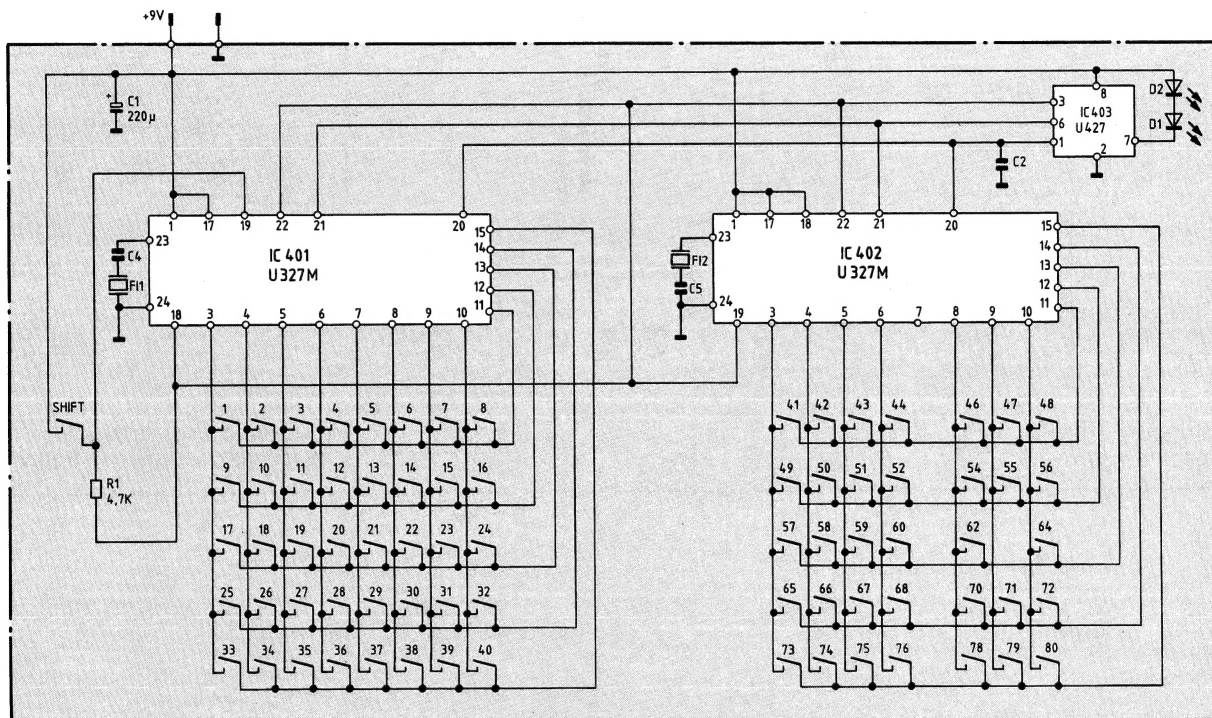
FERNSEHEN  
TELEVISION  
TÉLÉVISION

BTX

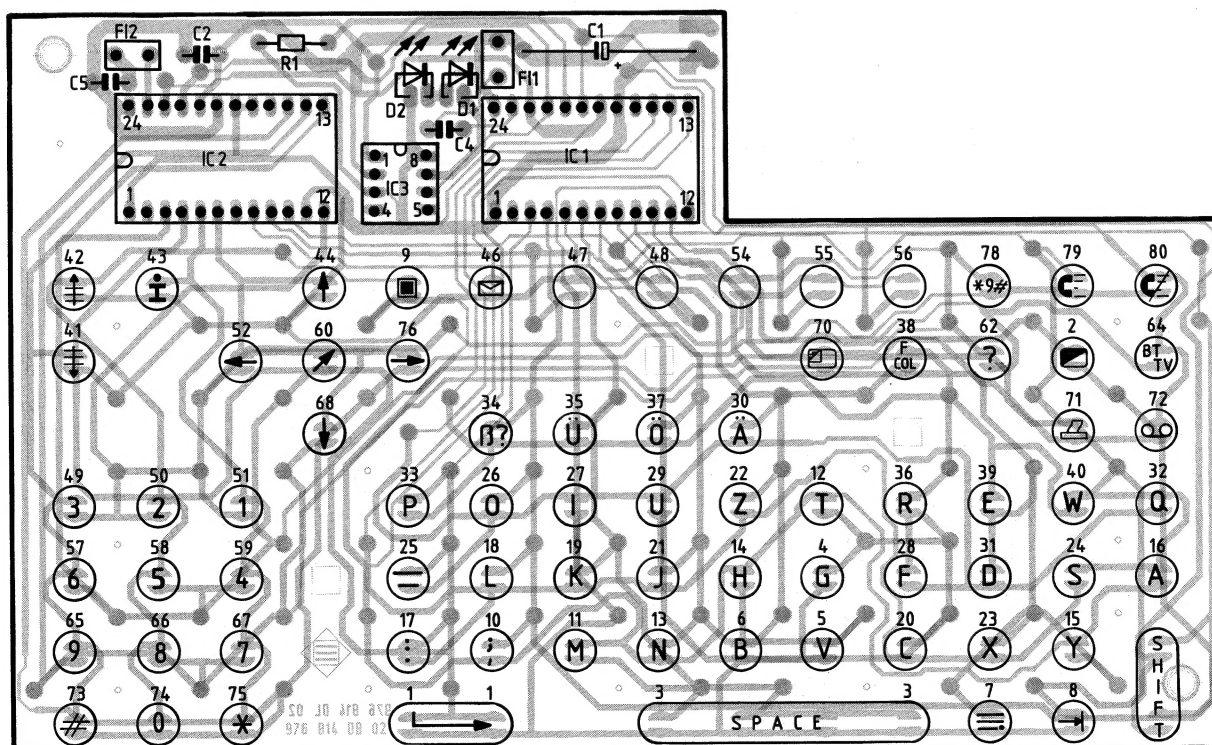
Druck-Nr. 319 392 974 PG C

## BTX-Decoder FZ 650 N

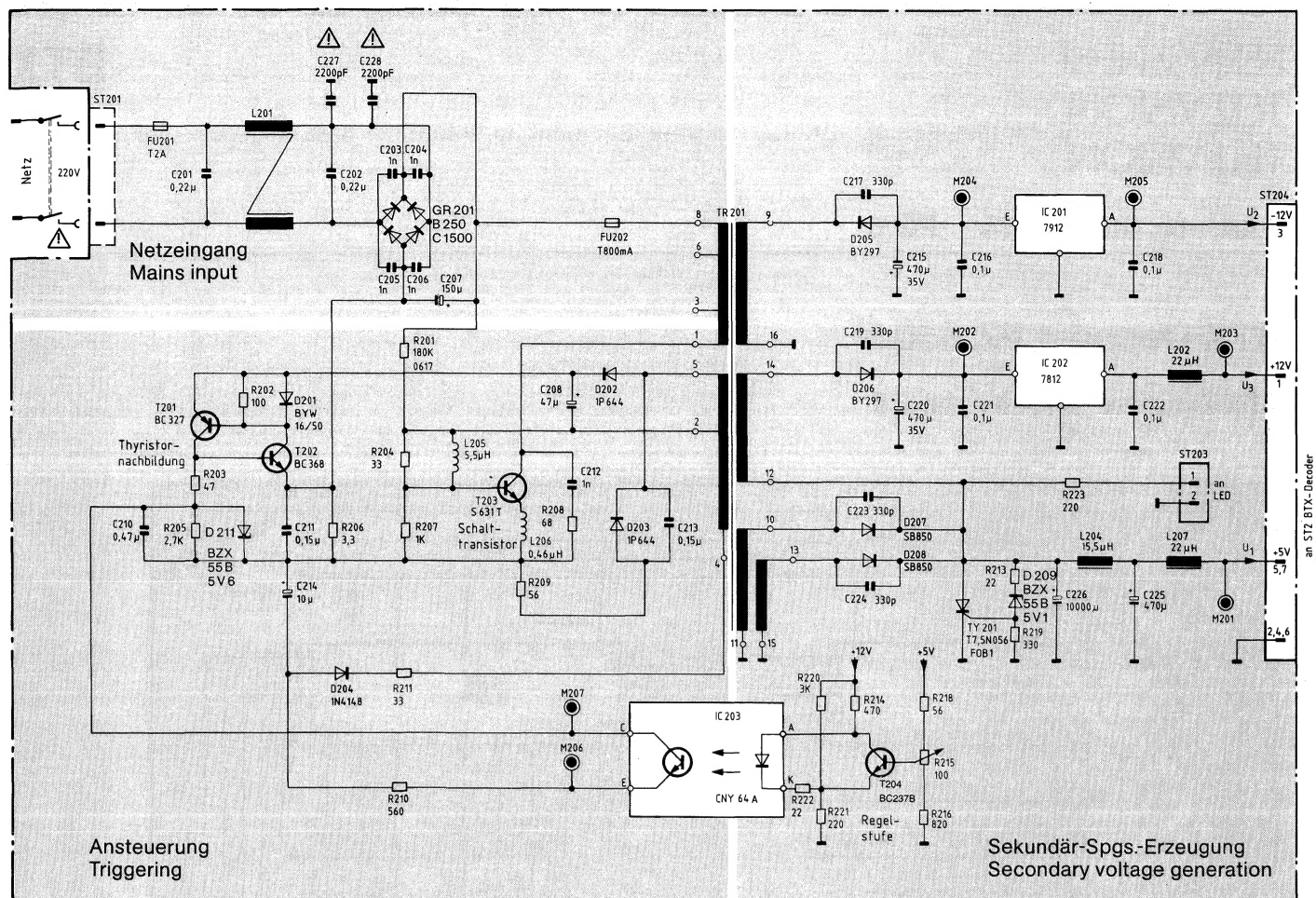
BTX-Tastatur · BTX-Keyboard



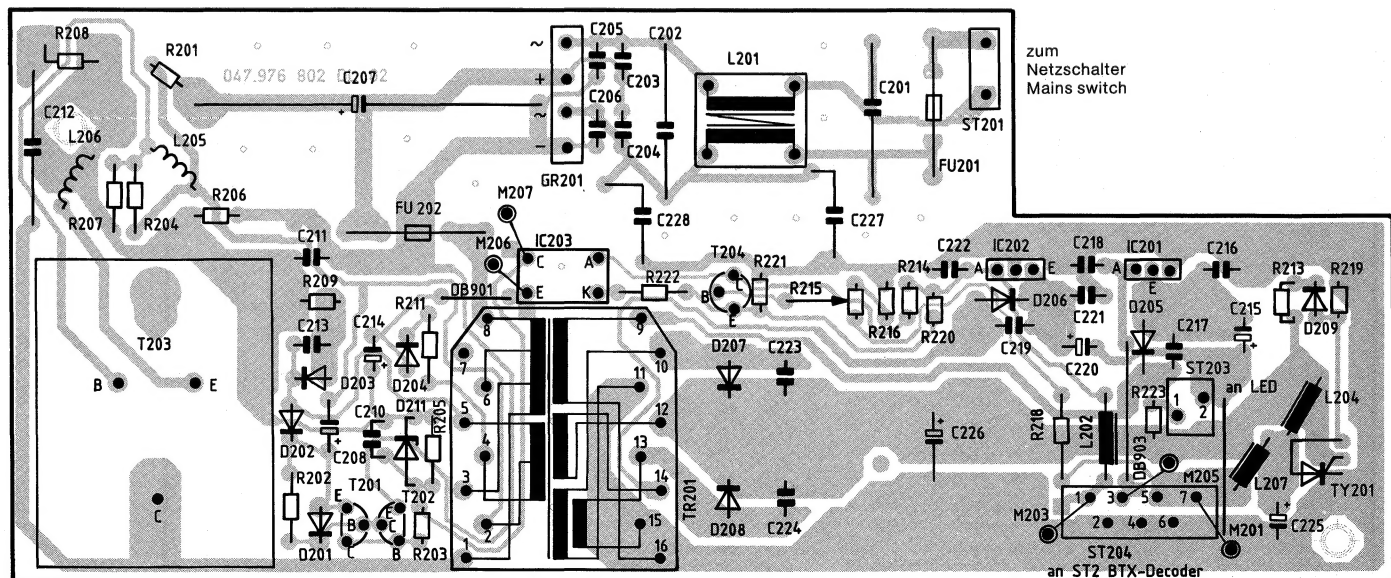
Ansicht auf Bestückungsseite/component side



# Netzteil für BTX-Decoder · Power Supply for BTX-Decoder

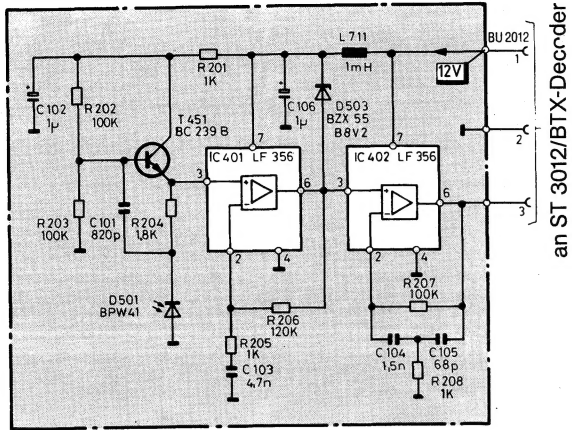


Ansicht auf Lötseite/solderside



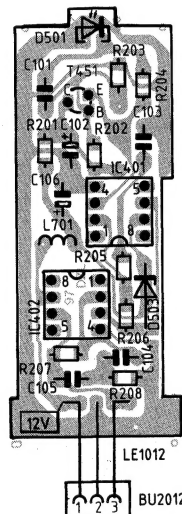


Infrarot-Verstärker  
Infrared Pre-amplifier



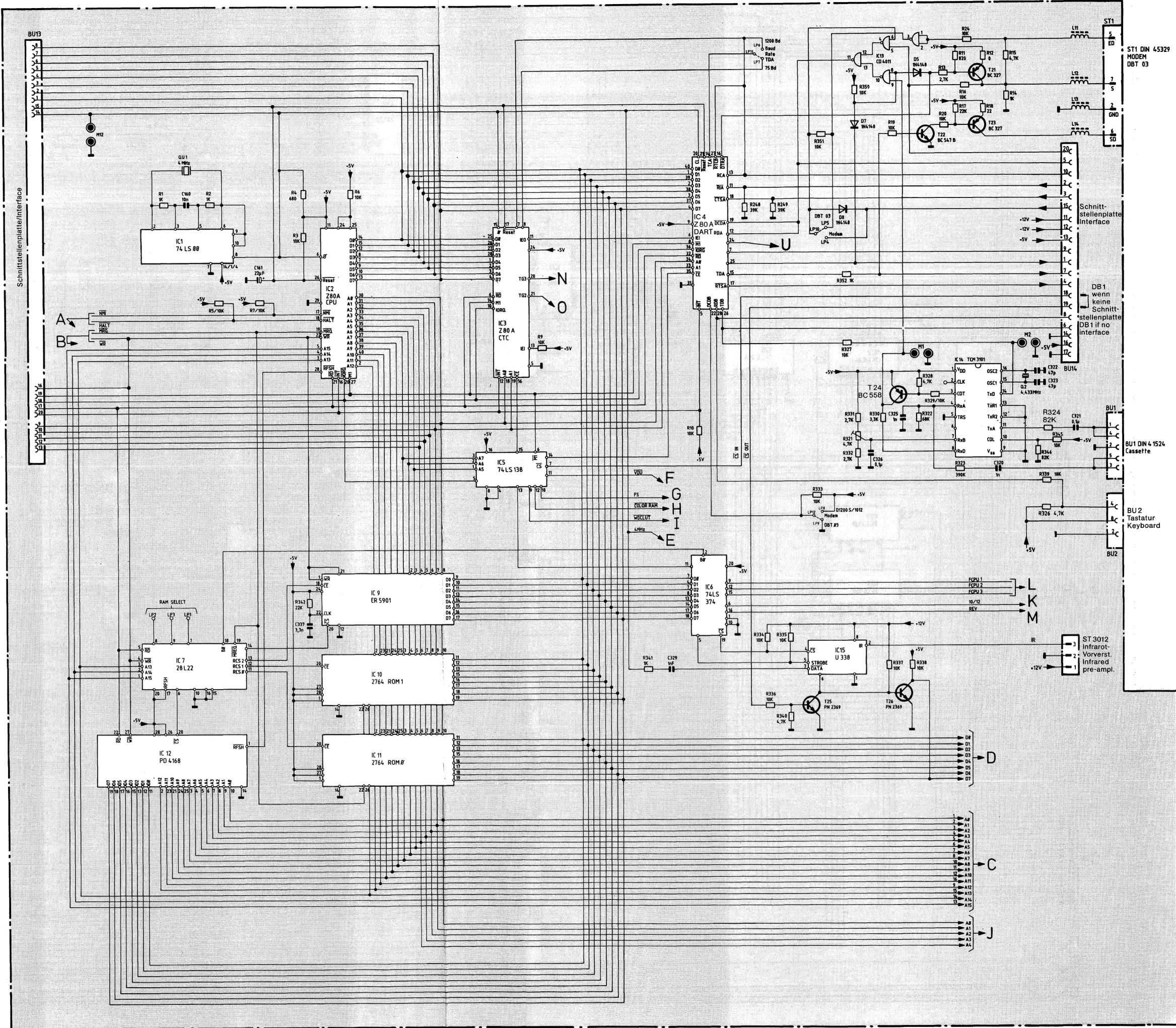
an ST 3012/BTX-Decoder

Ansicht auf Lötseite/solderside



an ST 3012/BTX-Decoder

BTX-Decoder Teil 1 · Part 1

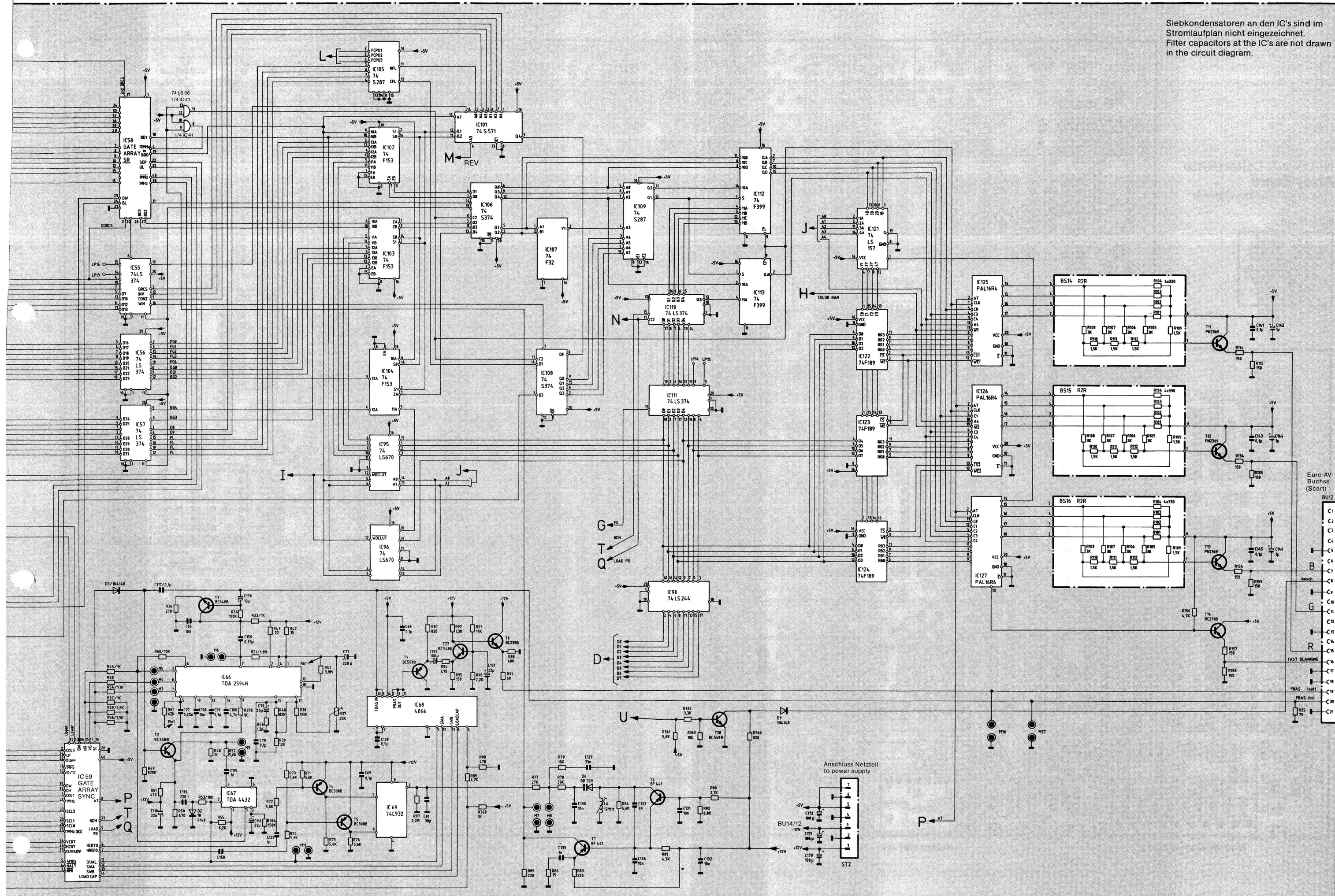








Siebcondensatoren an den IC's sind im Stromlaufplan nicht eingezeichnet.  
Filter capacitors at the IC's are not drawn in the circuit diagram.

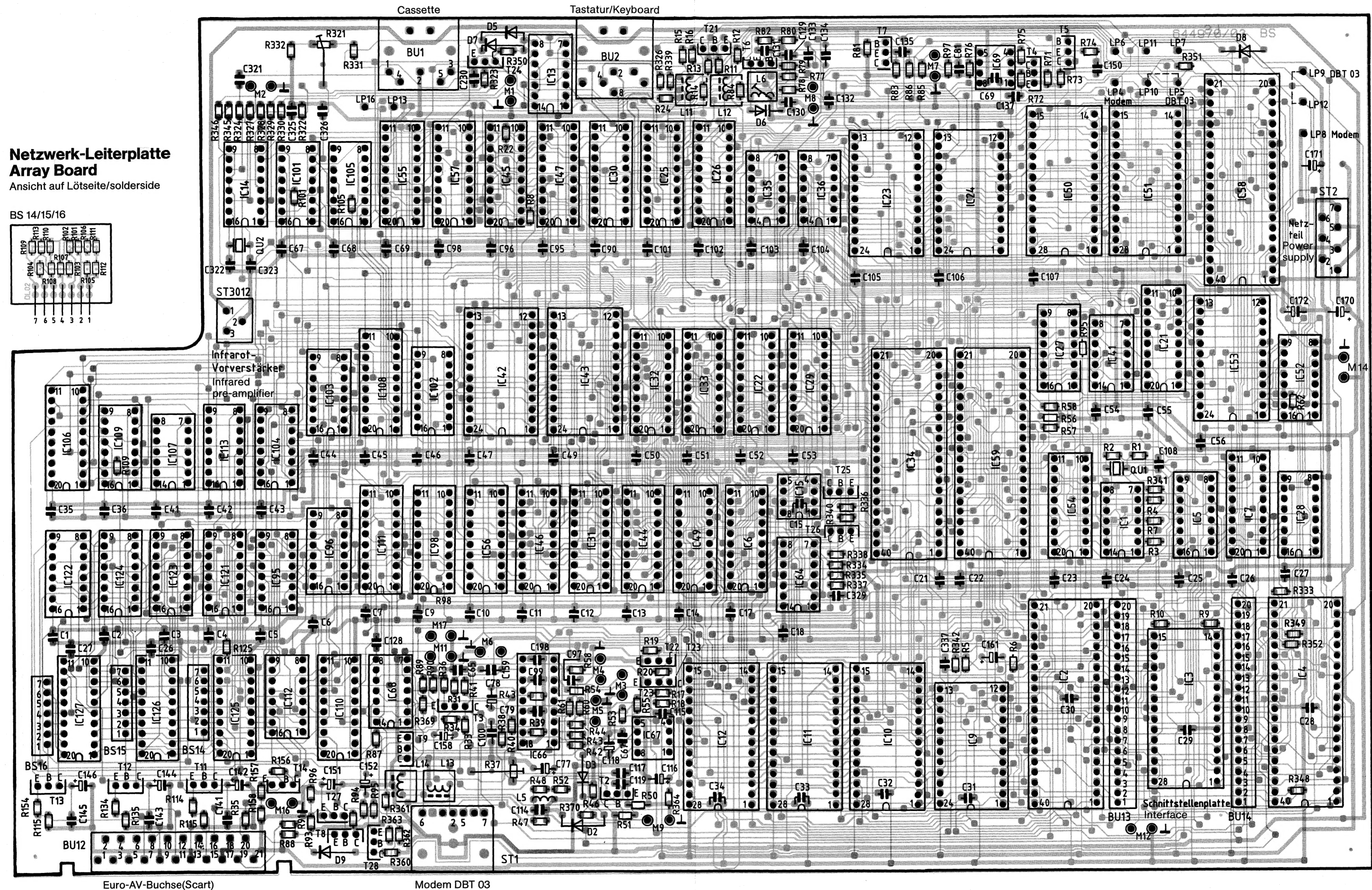
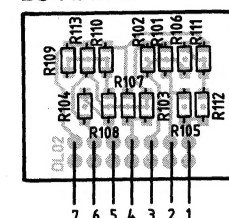




# Netzwerk-Leiterplatte Array Board

Ansicht auf Lötseite/solderside

BS 14/15/16





1. Bei  $U_{\text{Netz}} = 220 \text{ V} \sim$  und  $I_1 = 4 \text{ A}$ ,  $I_2 = -100 \text{ mA}$ ,  $I_3 = 350 \text{ mA}$  (Nennbetrieb) wird mit R 215 die Spannung  $U_1 = 5,10 \text{ V} \pm 20 \text{ mV}$  eingestellt. (Gemessen an M 201 und 5 min Einlaufzeit.)  
Bei Einstellung in kaltem Zustand (bis ca. 30 s nach Einschalten) werden  $5,15 \text{ V} \pm 20 \text{ mV}$  eingestellt.  
Toleranz bei Nachkontrolle  $\pm 50 \text{ mV}$ .  
An M 203 und M 205 müssen  $12 \text{ V} \pm 0,6 \text{ V}$  bzw.  $-12 \text{ V} \pm 0,6 \text{ V}$  stehen. Die Schaltfrequenz beträgt ca. 29 kHz.

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## Service Notes

Alignment and adjustments are carried out at a mains voltage of 220 volts and a warm-up time of appr. 5 minutes.  
Required measuring equipment:  
Isolating transformer (power rating  $\geq 300$  VA)  
Digital voltmeter  
Multimeter  $R_i = 50$  k $\Omega$ /V  
Frequency-counter  
Oscilloscope (with DC input)  
Rectangular pulse generator

## Test and alignment of BTX-power supply

Pre-setting set R 215 to full clockwise position

- At  $U_{\text{mains}} = 220$  V/AC and  $I_1 = 4$  A,  $I_2 = -100$  mA,  $I_3 = 350$  mA (nominal operation) set the voltage  $U_1$  to  $5.10 \text{ V} \pm 20$  mV with R 215 (measured on M 201 after 5 min warm-up time).  
Set voltage  $U_1$  to  $5.15 \text{ V} \pm 20$  mV, if adjustment is carried out within 30 s after switch-on of the set.  
Tolerances allowed during checking  $\pm 50$  mV.  
Testpoints M 203 and M 205 must indicate  $12 \text{ V} \pm 0.6 \text{ V}$  or  $-12 \text{ V} \pm 0.6 \text{ V}$  respectively.  
The sampling frequency is approx. 29 kHz.
- The power supply must start oscillation at a  $U_{\text{mains}} = 140$  V/AC.
- At  $U_{\text{mains}} = 190$  V/AC and  $I_1 = 2.5$  A,  $I_2 = -100$  mA,  $I_3 = 350$  mA the high-end voltage must indicate  $\geq 14.2$  V on testpoint M 202 and  $14.1$  V on TP M 204.
- At  $U_{\text{mains}} = 253$  V/AC and  $I_1 = 2.5$  A,  $I_2 = 0$ ,  $I_3 = 150$  mA the voltage  $U_1$  must indicate  $\leq 5.35$  V.
- At  $U_{\text{mains}} = 190$  V/AC and  $I_1 = 4$  A,  $I_2 = -100$  mA,  $I_3 = 350$  mA  $U_1$  should indicate  $\geq 4.85$  V and the ripple of  $U_1$ ,  $U_2$  and  $U_3$  must have a value of  $\leq 150$  mV<sub>pp</sub> ( $U_1$ ) and  $\leq 200$  mV<sub>pp</sub> ( $U_2$  and  $U_3$ ).

### 6. Protection circuit

At  $U_{\text{mains}} = 220$  V/AC and  $I_1 = 4$  A,  $I_2 = -100$  mA,  $I_3 = 350$  mA the phototransistor within IC 203 must be bypassed by bridging M 206/M 207.  
Thus, M 201 must indicate a voltage of  $\leq 1.5$  V, also after the bypass has been removed.  
The normal operating condition for switch-on of the set exists only after a waiting periode of more than 2 seconds.

## Test and alignment of BTX-decoder

### 1.1 CPU clock-frequency measurement

Measuring point: IC 1/pin 8  
Nominal-frequency: 4 MHz  $\pm 4$  kHz  
Low-level:  $\leq 0.8$  V  
High-level:  $\geq 4.4$  V

### 1.2 Cassette interface clock-frequency measurement

The crystal-frequency is indirectly derived from the IC 14/pin 11.  
M 2 on "LOW":  $f = 2100 \pm 8$  Hz  
M 2 on "HIGH":  $f = 1300 \pm 5$  Hz  
Level: appr.  $1.6 V_{\text{pp}}$  ( $= 0.565 V_{\text{rms}}$ )

### 1.3 Alignment of cassette-interface

Adjust the basic distortions to minimum by means of R 321.  
Preparations:  
Put a jumper from IC 14/pin 11 to BU 1/3; measuring frequency 600 Hz; duty cycle ratio 1:1; supply TTL-level to M 2.  
Measuring procedure:  
A clock frequency of 600 Hz is present on the output M 1, which is related to the input frequency. The clock output is time-shifted compared to the clock input and also is effected with isochronism distortions (time distortions).  
It has to be aligned to an average duty cycle ratio of 1:1, (basic distortion  $\leq \pm 2\%$ ).  
Measuring time: appr. 1sec.  
Thus resulting in isochronism distortions of max. 18%.

### 2. Test and alignment of the synchro circuits

Connect a video-signal to the Euro-AV-socket(Scart)  
BU 12/pin 20.

### 2.1 Pulse-signals of the TDA 2594 (IC 66)

Line pulse, M 5 (TDA 2594, pin 3):  
 $U = 10.5 \pm 0.5$  V  
 $t = 7 \pm 1.5$   $\mu$ sec  
Duty cycle, M 3 (TDA 2594, pin 7):  
 $U = 10.5 \pm 0.5$  V  
 $t = 4 \pm 0.3$   $\mu$ sec

Vertical pulse, M 4 (TDA 2594, pin 8):

$U = 5.0 \pm 1.0$  V  
Delay between the front edge of the input- and the output signal:  
 $t = 15.0 \pm 1.0$   $\mu$ sec

### 2.2 Test and alignment of the line-oscillator

Shorten M 6 of IC 66 (TDA 2594, pin 11) to ground.  
Measure frequency on M 5 of IC 66 (TDA 2594, pin 3).  
Adjust frequency with R 37 to  $f = 15625 \pm 10$  Hz.  
Lock-in and hold range =  $\pm 500$  Hz

### 2.3 Tests of the quality circuit IC 67 (TDA 4432; T 2)

Black-level measurement of the video signal  
(Oscilloscope connected to collector of T 2)  
Black-level =  $0.4 \pm 0.2$  V  
Switching action of the TDA 4432:  
Connect oscilloscope to TDA 4432 pin 7 (M 11).  
At a signal to noise (S/N) ratio of 22 ... 28 dB, the voltage on M 11 must switch from  $< 0.5$  V auf  $> 5$  V.  
Resulting from the hysteresis the voltage on M 11 will be improved in S/N ratio by  $4 \pm 1$  dB.  
Note:  
If a video signal-generator is not available, it is also possible to use the video-signal of a colour TV-set instead. Take off the video-signal from the Euro-AV-socket(Scart). At a antenna signal of 50 to 100  $\mu$ V, the voltage on M 11 must switch from  $< 0.5$  V to  $> 5$  V. Reset takes place, when the antenna signal is raised about  $4 \pm 1$  dB.

### 2.4 Test and alignment of the 12 MHz-oscillator

Frequency alignment:  
Connect (low impedance) 6.0 V to M 8.  
Connect frequency counter to M 7 (collector T 7) and adjust the frequency to  $12 \text{ MHz} \pm 15$  kHz with L 6.  
Tuning range of the 12 MHz-oscillator:  
Supply (low impedance) 8.0 V to M 8.  
Check the frequency on M 7:  $f > 12.4$  MHz  
Supply (low impedance) 4.0 V to M 8  
Check the frequency on M 7:  $f < 11.6$  MHz  
Fine-tuning the 12 MHz-oscillator:  
Connect oscilloscope ( $R_i \geq 10$  M $\Omega$ ) to M 8.  
With internal clock signal (not MIX-mode) set the voltage on M 8 to 50% of the operating voltage (12 V) with L 6.  
The final adjustment has to be carried out when the belonging power supply is connected.

### 2.5 Test of the video-signal BU 12/pin 19 (M 16)

At internal BTX-operation:  
Sync. signal =  $0.4 \pm 0.1$  V  
At MIX-operation:  
FBAS (composite signal) =  $1 \pm 0.2$  V with an input signal of 1 V on BU 12/pin 20 (M 17).

### 2.6 Testing the line-interlace

Set TV-signal ( $\geq 1$  mV) to programme-place AV.  
Actual: no line interlacing (clear line structure visible; the characters of the BTX-decoder are very steady).  
Set TV-signal ( $\geq 1$  mV) to normal programme place (not AV).  
Actual: line interlacing observed (line structure hard to detect; characters of the BTX-decoder show vertical jitter).

### 3. Connection for DBT 03

The function test is carried out with the aid of a modem simulator.  
Electrical test:  
The following voltage values have to be kept in ON-LINE mode:  
Between pin 7 and 2 of ST 1 at  $R_L = 120$  ohms:  $> 4.55$  V  
Between pin 6 and 2 of ST 1 at  $R_L = 270$  ohms:  $> 4.00$  V  
Voltage values in OFF-LINE mode:  
Between pin 7 and 2 of ST 1 at  $R_L > 10$  kohms:  $< 0.8$  V  
Between pin 6 and 2 of ST 1 at  $R_L > 10$  kohms:  $< 0.8$  V  
For an irreproachable function of this interface by the German anti-radiation law (FTZ 157 D 2 E), the resistance value of R 15 must be in the range of  $4.3$  kohms  $\pm 5\%$ .

### 4. Connection for keyboard

The keyboard can be tested in OFF-LINE mode by actuating a few letters and visual control of the written text on the screen.

### 5. Connection of the Scart cable

The output signals of the Euro-AV-socket(Scart) can be tested by a display of test pages on a colour TV-screen.  
In addition, the voltage on pin 8 of the Euro-AV-socket(Scart) has to be checked:  
BT-mode:  $> 10.2$  V (at  $R_L = 10$  kohms)  
TV-mode:  $< 1.0$  V

## Ersatzteilliste · Spare parts list

**Wichtig:** Bei Ersatzteilbestellungen bitte **unbedingt** die neunstellige **Bestellnummer** angeben!  
**N.B.:** When demanding Spare Parts it is **absolutely necessary** to quote the nine digit **Part Number**!

Position	Preis-gruppe	Bestell-Nr. Stock-Nr.	Bezeichnung Item
BS 3 BS 4	LA SA	319.392.775 349.370.018 349.398.098	Bedienungsanleitung/operation instructions <b>Austauschteile/Exchange parts</b> IR-Vorverstärker 6/IR-pre-amplifier 6 FZ 655, BTX-Tastatur/FZ 655, BTX keyboard
BS 1			<b>Bausteine (keine Austauschteile)/ Modules (no exchange parts)</b> <b>Leiterplatte BTX-Decoder FZ 650 N/ Decoder board FZ 650 N</b>
BS 14/15/16	H	309.378.054	<b>Netzwerk-Leiterplatte/Array board</b>
BU 1 BU 2 BU 12 BU 13/14 BU 102/104 134/158/159 BU 103/110 111/150/151 BU 109	W* H B F D B	309.679.945 309.679.956 309.651.001 309.651.002 309.689.930 309.689.947 309.689.933	Mehrfachbuchse, 5-polig/multiple socket Tastatur-Buchse, 6-polig/socket f. keyboard Buchsenleiste, 21-polig R 3,8/sockets bar Buchsenleiste, 20-polig R 2,5/sockets bar IC-Fassung, 40-polig/IC socket IC-Fassung, 28-polig/IC socket IC-Fassung, 24-polig/IC socket
C 77 C 78 C 116/118 151/161 C 142/144/146 C 158 C 170-172	A N* R* P* N* N*	309.414.807 309.411.722 309.411.725 309.410.734 309.411.718 309.413.520	Elko 220 $\mu$ F/20%/16 V Elko 22 $\mu$ F/20%/16 V Elko 22 $\mu$ F/20%/35 V Elko 1 $\mu$ F/20%/50 V Elko 10 $\mu$ F/20%/35 V Elko 100 $\mu$ F/20%/25 V
D 2/3/5/7-9 D 6	R* U*	309.325.927 309.327.073	Diode 1 N 4148 Varaktor BB 329
IC 1 IC 2 IC 3 IC 4 IC 5 IC 6/44-47 54-57/110 111 IC 7 IC 9 IC 11 IC 12	C M M R E H O N Z	309.368.224 309.368.371 309.368.372 309.368.373 309.368.374 309.368.375 309.368.425 309.368.452 309.368.426 309.368.378	IC-DM 74 LS 00 N Mikroprozessor Z 80 A CPU Mikroprozessor Z 80 A CTC IC-Z 80 A DART IC-74 LS 138 IC-74 LS 374
IC 13 IC 14 IC 15 IC 21/22/25/26 30-33/98	H V K H	309.368.102 309.368.379 309.368.346 309.368.382	MOS-IC MC 1411 CP MOS-IC TCM 3101 MOS-IC U 338 N IC-74 LS 244
IC 23/24/42/43 IC 27/28 IC 29 IC 34 IC 35	P E O U D	309.368.383 309.368.384 309.368.427 309.368.386 309.368.387	MOS-IC 6116 IC-74 LS 139 IC-TBP 28 L 22 NDR PROM progr. MOS-IC 9937 IC-74 LS 32
IC 36/41 IC 49 IC 50 IC 51 IC 52	D O O O K	309.368.388 309.368.389 309.368.428 309.368.429 309.368.430	IC-74 LS 08 IC-74 S 472 IC-ZA 64263 IC-ZA 64261 IC-TBP 24 S NSE PROM progr.
IC 58 IC 58 IC 59 IC 64 IC 66	T R Q G K	309.368.392 309.368.431 309.368.432 309.368.433 309.368.393	IC-87 S 191 MOS-IC Gate-Array-SR MOS-IC Gate-Array-SYNC IC-74 LS 393 IC-TDA 2594 N
IC 67 IC 68 IC 69 IC 95/96 IC 101	H E H H N	309.368.394 309.368.434 309.368.395 309.368.396 309.368.435	IC-TDA 4432 MOS-IC 4066 MOS-IC 74 C 932 IC-74 LS 670 IC-74 S 571 GE PROM progr.
IC 102-104 IC 105 IC 106/108 IC 107 IC 109 IC 112/113 IC 121 IC 122-124 IC 125 IC 126 IC 127	I L K F L F Q U U U	309.368.398 309.368.436 309.368.399 309.368.400 309.368.437 309.368.401 309.368.402 309.368.403 309.368.438 309.368.439 309.368.440	IC-74 F 153 IC-74 S 287 IC-74 F 374 IC-74 F 32 IC-74 S 287 WE PROM progr. IC-74 F 399 IC-74 LS 157 IC-74 F 189 IC-PAL 16 R 4 A RT progr. IC-PAL 16 R 4 A GN progr. IC-PAL 16 R 6 A BL progr.
L 6 L 11-14	A A	309.249.268 309.249.979	Spule 12 MHz/coil 12 MHz Drosselspule/choke coil
QU 1 QU 2	G G	309.335.702 309.335.712	Schwingquarz 4,0 MHz/crystal 4,0 MHz Schwingquarz 4,43 MHz/crystal 4,43 MHz
R 37 R 321	R* R*	309.509.122 309.509.125	Trimmwid. 25 K $\Omega$ m/0,1 W/var.resistor Trimmwid. 5 K $\Omega$ m/0,1 W/var.resistor
ST 1 ST 2 ST 3012	H W* N*	309.669.966 309.650.965 309.650.011	Modem-Stecker, 7-polig/connector f. modem Steckerleiste, 7-polig R 2,5/connecting bar Steckerleiste, 3-polig R 2,5/connecting bar
T 2/9 T 3/27/28 T 4/5/24 T 6/7 T 8/14 T 11-13/25/26 T 21/23 T 22	U* N* T* E R* V* U* R*	309.001.226 309.001.293 309.001.248 309.001.132 309.001.949 309.009.806 309.001.106 309.001.956	Transistor BC 558 B Transistor BC 548 B Transistor BC 308 B Transistor BF 441 Transistor BC 238 B Transistor PN 2369 Transistor BC 327 Transistor BC 323 B
BS 2	Z	309.378.053	<b>Leiterplatte Netzteil BTX-Decoder/ Power supply board</b>
C 201/202 C 207 C 208 C 212 C 214 C 215	I B E A N* B	309.434.622 309.418.405 309.412.690 309.431.474 309.411.718 309.414.790	MP-Kond. 0,22 $\mu$ F/20%/275 V AC Elko 150 $\mu$ F+30-10%/385 V Elko 47 $\mu$ F+30-10%/63 V KPS-Kond. 1000 pF/5%/2000 V Elko 10 $\mu$ F/20%/35 V Elko 470 $\mu$ F+50-10%/35 V

Position	Preis-gruppe	Bestell-Nr. Stock-Nr.	Bezeichnung Item
C 220 C 225 C 226 C 227/228	B A J C	309.414.831 309.414.797 309.414.825 309.440.663	Elko 470 $\mu$ F+50-10%/35 V Elko 470 $\mu$ F+50-10%/25 V Elko 10.000 $\mu$ F+50-10%/25 V Kerko 2200 pF/20%/400 V AC
D 201 D 202/203 D 204 D 205/206 D 207/208	A B R* C N	309.325.088 309.327.979 309.325.927 309.325.087 309.327.094	Diode BYW 16/50 Diode 1 P 644 Diode 1 N 4148 Diode BY 297 Diode SB 850 m. Kühlblech
D 209 D 211	T* N*	309.325.062 309.325.147	Diode BZX 55 B 5 V 1 Diode BZX 55 B 5 V 6
FU 202 FU 210	R* A	309.627.918 309.627.915	Sicherung T 800 mA/fuse T 800 mA Sicherung T 2 A/fuse T 2 A
GR 201	F	309.320.932	Gleichrichter B 250 C 1500/rectifier
IC 201/202 IC 203	L H	309.368.424 309.368.406	IC 7912/TDD 1612 S m. Kühlblech/w. heat sink Optoelekt. Koppler CNY 64 A/ opto coupling CNY 64 A
L 201 L 202 L 204/207 L 205 L 206	G R* C A T*	309.259.989 309.250.976 309.250.961 309.250.945 309.259.932	Netzeingangs-drossel/mains input choke Drosselspule 22 $\mu$ H/choke coil Drosselspule 15 $\mu$ H/choke coil Drosselspule 5,5 $\mu$ H/choke coil Spoke-Drosselspule 0,46 $\mu$ H/spoke choke coil
LE 202	F	309.699.355	Bandtlg. m. Buchsenl. 7-adrig/ twin lead w. sockets bar, 7pol.
R 206 R 208 R 209 R 215	R* T* N* A	309.556.238 309.540.636 309.539.642 309.504.608	Drahtwid. 3,3 Ohm/1 W/wire resistor Wid. 68 Ohm/4 W Metox/Metox resistor Wid. 56 Ohm/2 W Metox/Metox resistor Trimmwid. 100 Ohm/0,07 W/var. resistor
ST 204 ST 203	W* N*	309.650.965 309.650.008	Steckerleiste, 7-polig R 2,5/connecting bar Steckerleiste, 2-polig R 2,5/connecting bar
T 201 T 202 T 203 T 204	U* C J R*	309.001.106 309.001.246 309.005.017 309.001.956	Transistor BC 327 Transistor BC 368 Transistor S 631 T m. Kühlbl./w. heat sink Transistor BC 237 B
TR 201	S	309.307.530	SMPS-Trenntrafo BTX-Decoder/ SMPS separation transformer
TY 201	E	309.326.923	Thyristor T 7,5 N 600 FO B 1
BS 5			<b>Netzschalter, vollst./Mains switch, cpl.</b>
LE 201	F	309.695.935	Netztlg. m. Stecker, 2-adrig/ mains cable w. connctor, 2 pol.
S 201	F	309.630.046	Netzschalter/mains switch
D 1	H	309.368.404	<b>Sonstige elektrische Teile/ Other electrical spare parts</b>
IC 10	W	309.368.441	LED-Anzeige V 332 P/LED display V 332 P
LE 1 LE 2	Q L	309.699.318 309.699.319	IC-MK 2764-3 GN EPROM progr. Überspielleitung Peri/cable f. scart Überspielleitung Modem/cable f. modem
Dec. FZ 650 N	T* N*	309.986.964 309.900.389	<b>Mechanische Ersatzteile/ Mechanical spare parts</b> Klemmfeder/clamping spring Zugentlastung f. BTX-Netztlg./ pull-relief f. BTX mains cable Abdeckung f. BTX-Netzteil/ cover f. BTX power supply Abdeckung f. BTX-Decoder/ cover f. BTX decoder
BS 5:	E F E N* P*	309.834.115 309.834.116 309.955.927 309.653.501 309.870.659	Berührungsschutz f. BTX-Netzteil/ safety protector device f. BTX-power supply Sicherungshalter/fuse holder Spannband/tension band
	O K K W* A E	309.797.840 309.797.841 309.834.077 309.771.980 309.834.079 309.801.036	<b>Gehäuseteile f. BTX-Decoder FZ 650 N/ Cabinet parts f. BTX-dec. FZ 650 N</b> Gehäuse-Oberteil/cabinet, top part Gehäuse-Unterteil/cabinet, bottom part Frontblende/front mask Gehäusefuß/cabinet foot IR-Abdeckung/IR cover Drucktaste f. Netzschalter/ push button f. mains switch
BS 1		559.953.328	<b>Schnittstellen-Adapter/ supplementary interface board</b>
BU 13/14 BU 21 BU 22/23	F N L	309.651.002 309.651.008 309.679.957	Buchsenleiste, 20-polig R 2,5/sockets bar Buchsenleiste, 36-polig, sockets bar Buchse V 24, 25 polig/socket V 24
C 4/7/13	V*	309.411.653	Elko 10 $\mu$ F+100-10%/25 V
D 1-4	R*	309.325.927	Diode 1 N 4148
IC 1 IC 2 IC 3 IC 4 IC 5/6 IC 7	L D H H H E	309.368.446 309.368.447 309.368.382 309.368.380 309.368.381 309.368.448	IC-Z 80 AP 10 IC-74 LS 00 IC-74 LS 244 IC-SN 75189 IC-SN 75188 MOS-IC-74 HC 00
ST 13/14	C	309.650.022	Steckerleiste, 20-polig R 2,5/connecting bar
T 1/2/4	N* R*	309.001.293 309.930.948	Transistor BC 548 B Befestigungswinkel/circuit board support

Änderungen vorbehalten

Subject to change

Sach-Nr. 392974

8506